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| EXAMINER |
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WEI, ZHENG

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| ART UNIT | PAPER NUMBER |
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2192

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10/03/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/673,857

Applicant(s)

SUTTER ET AL.

Examiner

Zheng Wei

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 July 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13, 16-28 and 31 is/are rejected.
- 7) ☐ Claim(s) 14, 15, 29 and 30 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 July 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Remarks

1. This office action is in response to the amendment filed on 07/19/2007.
2. Claims 1, 10 and 13-31 have been amended.
3. The objections to claims 10, 11, 15, 25, 26 and 30 are withdrawn in view of the Applicant's amendment.
4. The 35 U.S.C. § 112 second paragraph rejection to claims 13-15 and 28-30 are withdrawn in view of the Applicant's amendment.
5. The 35 U.S.C. 101 rejections of claims 16-30 are withdrawn in view of the Applicant's amendment.
6. The replacement of drawing filed on 07/19/2007 has been accepted;
7. Claims 1-31 remain pending and have been examined.

Response to Amendment and Arguments

8. Applicant's amendment filed on 07/19/2007 changes the scope of claims 1-31. Therefore, a new group of rejection is applied.

Claim Objections

9. Claims 14-15 and 29-30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 1-13, 16-22, 24-28 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tip (Tip et al., Class Hierarchy Specialization) in view of Pauw (Pauw et al., Visualizing the execution of Java Programs) and further in view of Sweeney (Sweeney et al., Extracting Library-Based Object-Oriented Applications)

Claim 1:

Tip discloses a method on an information processing system for automatic replacement of object classes, comprising:

- performing static analysis on a program containing a plurality of objects in order to determine constraints on the transformations that can be applied and to detect unused functionality in one or more of the objects to be replaced (see for example, p.271, section 1, Introduction, lines 7-8, "We present an algorithm that specializes a class hierarchy with respect to its usage in a program P");
- analyzing the plurality of objects to detect usage patterns of functionality in the one or more objects replaced (see for example, p.271, section 1,

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Introduction, line 9, “analyzes the member access patterns for the variables in P”); and

- generating customized classes based upon the static analysis and the usage patterns detected (see for example, p.271, section 1, Introduction, line 10, “creates distinct classes for variables that access different member”).

But does not disclose amended limitation of the “analyzing at least one execution of the program to collect profile information for the one or more objects” and generating customized classes further base on the “profile information which has been collected”. However, Pauw in the same analogous art of collecting and displaying profile information of the execution of Java program discloses (see for example, p.152-153, Fig.1-2 and related text).

But both of Tip and Pauw do not disclose generating customized classes also bases on profile data. However, Sweeney in the same analogous art of object-oriented programming optimization, discloses the necessity about using dynamic collected (profile data) (see for example, p.98, right column, third bullet, “because a static analysis alone is incapable of determining the program constructs that are used”). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use Pauw 's method to collect profile data to further optimize Tip's method to generate customized class. One would have been motivated to do so to optimize the objected-oriented application as suggested by Sweeney.

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Claim 2:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses wherein the performing static analysis on a program containing a plurality of objects in order to determine constraints includes determining constraints which are type constraints (see for example, p.272, section 1.3 Overview of algorithm, second paragraph "Phase II is concerned with the computation of type constraints that precisely capture the required subtype-relationships between the types of variables, and the visibility relation between class members and variables..."; also see section 3, Phase II: Computing Type Constraints).

Claim 3:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses wherein the plurality of objects is a plurality of container objects (see for example, p.275, Figure 3(a), example class hierarchy graph and related text).

Claim 4:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip also discloses wherein the analyzing the plurality of objects to detect usage patterns of functionality in the one or more objects replaced (see for example, p.271, section 1, Introduction, line 9, "analyzes the member access patterns for the variables in P") and Pauw further discloses a tool Jinsight for instrumenting Java

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program (see for example, p.152, section 3: Pattern Extraction in the Reference Pattern View"). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to further use Pauw's tool to analyze Tip's program P to get access patterns for variables in P as suggested by Tip.

Claim 5:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses the method further comprising

- rewriting bytecode of an application to use the generated classes while providing transparency in the program's observable behavior during the replacement of the objects (see for example, p.281, section 5, Phase IV: Simplification. Lines 1-5, "which may result in a reduction in the number of compiler generated fields in objects")

Claim 6:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses wherein the performing static analysis further comprises:

- performing static analysis to determine constraints by determining if the type of one or more objects to be replaced is a supertype of a type referenced in a cast expression (see for example, section 3 Phase II: Computing Type

Constraints; also see p.275, last paragraph, "Typecasts can be modeled as follows...")

Claim 7:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses wherein the performing static analysis further comprises performing static analysis to determine type-correctness constraints by determining if the type of one or more objects to be replaced is a supertype of a type referenced in a cast expression (see for example, p.275-276, section 3.1, section 3.2 Declarations vs. definitions of members, third paragraph and section 3.4 Type constraints due to assignments about type-correct").

Claim 8:

Tip discloses the method according to claim 1, but does not explicitly disclose wherein the performing static analysis further comprises performing static analysis to determine interface-compatibility constraints in one or more of the objects to be replaced. However, Sweeney in the same analogous art of extracting Library-Based object-oriented application discloses dynamic analyses of class interface (see for example, p.101, third paragraph to right column first, second paragraphs). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to check interface-compatibility constraints in one or more of object to be replaced as suggested by

Sweeney (p.101, third paragraph, "because the analyses upon which these optimizations are based typically need to know which classes are instantiated, and which methods are invoked").

Claim 9:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses wherein the performing static analysis further comprises performing static analysis to preserve run-time behavior for casts and *instanceof* operations for one or more of the objects to be replaced (see for example, p.278, right column, last paragraph, "that is need to preserve the behavior of type-cast and member lookup in P").

Claim 10:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses wherein the performing static analysis includes using point-to sets analysis to determine where references to classes in allocation sites, declarations, casts and *instanceof*-expressions are modifiable to refer to one or more of the objects to be replaced (see for example, p.274, section 2.3 Points-to analysis).

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Claim 11:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses wherein the performing static analysis includes using point-to sets analysis to determine where references to container classes in allocation sites, declarations, casts and *instanceof*-expressions are modifiable to refer to one or more of the objects to be replaced (see for example, p.274, section 2.3 Points-to analysis).

Claim 12:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses wherein the generating customized classes does not require a programmer to supply any additional types and additional external declarations for the customized classes (see for example, p.281, section 5, Phase IV: Simplification, "transformation rules").

Claim 13:

Tip, Pauw and Sweeney disclose the method according to claim 1, Tip further discloses where the generating customized classes based upon the usage patterns detected includes:

- identifying a customizable container class C with superclass B (see for example, p.275, Figure 3, class hierarchy graph and related text);

- creating a class *CustomC* which contains methods and fields that are identical to those in class *C*, wherein if *B* is not customizable, then *CustomC*'s superclass is *B*, otherwise *CustomC*'s superclass is *CustomB* (see for example, p.278, section 4.1 classes of the specialized hierarchy, definition 4.1 NewClasses and related text);
- introducing a type C_{\top} and making both *C* and *CustomC* a subtype of C_{\top} and wherein type C_{\top} contains declarations of all methods in *C* that are not declared in any superclass of *C* (see for example, p.279, section 4.3 The specialized class hierarchy, "Class T.sub.decl" and related text); and
- introducing a type C_{\perp} and making C_{\perp} a subclass of both *C* and *CustomC*, wherein type C_{\perp} contains no methods, wherein C_{\top} and C_{\perp} are intermediate types not provided as output during the generation of custom classes (see for example, p.279, section 4.3 The specialized class hierarchy, "Class T.sub.var(x)" and related text)

Claims 16-28:

Claims 16-28 are computer program products version of the claimed method, wherein all claimed limitation functions have been addressed in claims 1-12 above respectively. It is well known in the computer art that such method steps can be implemented as computer program and can be practiced and /or stored on a computer operable media. Thus, they also would have been obvious in view of reference teachings above.

Claim 31:

Claim 31 is a system version for performing the claimed method as in claims 1 addressed above, wherein all claimed limitation functions have been addressed and/or set forth above and certainly a computer system/information procession system would need to run and/or practice such function steps disclosed by reference above. Thus, it also would have been obvious.

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.
13. Applicant's arguments/amendments with respect to claims rejection have been considered but are moot in view of the new grounds of rejection.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory

action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zheng Wei whose telephone number is (571) 270-1059 and Fax number is (571) 270-2059. The examiner can normally be reached on Monday-Thursday 8:00-15:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (571) 272-3695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature of relating to the status of this application or proceeding should be directed to the TC 2100 Group receptionist whose telephone number is 571- 272-1000.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-


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free). If you would like assistance from a USPTO Customer Service

Representative or access to the automated information system, call 800-786-

9199 (IN USA OR CANADA) or 571-272-1000.

ZW



TUAN DAM
SUPERVISORY PATENT EXAMINER